

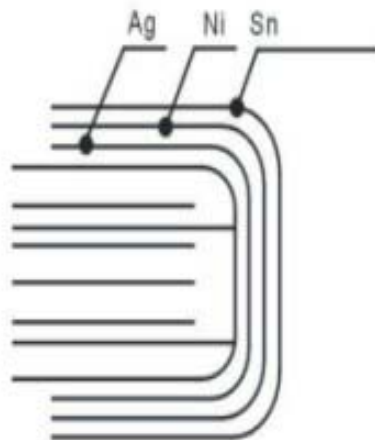
# MULTILAYER CERAMIC CHIP CAPACITORS(MLCC)

## Features

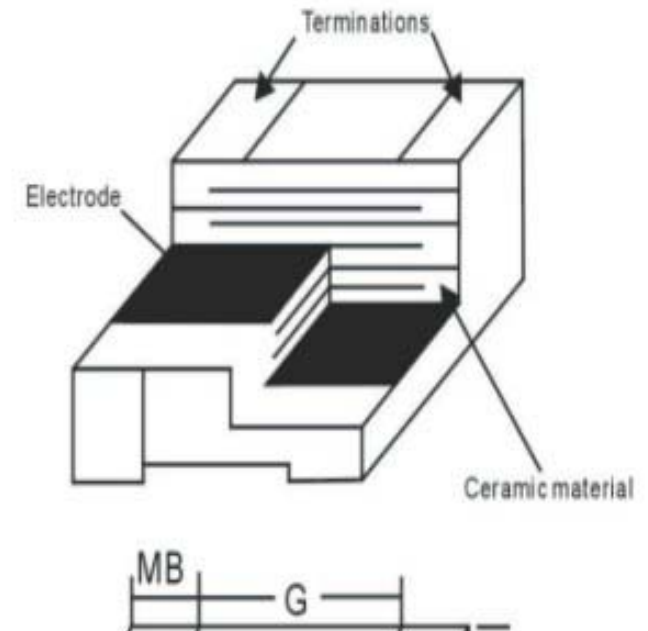
- Various temperature characteristics a wide range in small size.
- Mounted either by flow soldering methods.
- Excellent dielectric strength due to uniform structure of dielectric layers.
- 500v~3000VDC high voltage application.

## Applications

- MLCC are becoming increasingly important key electronic applications, which are helpful in reducing the size of electronic circuitry.
- MLCC are used extensively in computers, communicative products, and the detail applications which including the following:
  - By-Passing of an AC Signal
  - Frequency Discrimination
  - Transient Voltage and Are Suppression
  - Surge Protection



## Construction of MLCC



## Part Number Code

C0805

N

120

J

IH

N

T

(1)

(2)

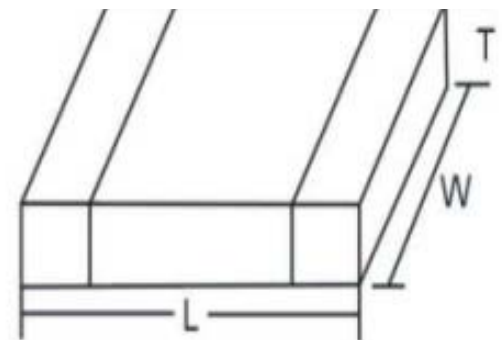
(3)

(4)

(5)

(6)

(7)



## Size Code

Unit:mm

Size Code	L	W	T	MB	G(min)
0201	0.60±0.05	0.30±0.05	S:0.50±0.20	0.10~0.20	0.2
0402	1.00±0.05	0.50±0.05	S:0.50±0.10	0.15~0.35	0.3
0603	1.60±0.15	0.80±0.12	P:0.75±0.30	0.27~0.60	0.5
0805	2.0±0.2	1.25±0.20	S:0.60±0.20	0.30~0.70	0.7
			M:0.75±0.20		
			H:0.95±0.30		
			X:1.30±0.30		
1206 1210	3.2±0.2 3.2±0.2	1.60±0.20 2.5±0.2	S:0.60±0.20	0.30~0.70	1.5
			M:0.75±0.20		
			H:0.95±0.30		
			X:1.30±0.30		
1808	4.5±0.3	2.0±0.20	X:1.30±0.30	0.35~0.95	0.2
			F:1.60±0.40		
			Z:2.00±0.40		
1812 2220 2225 3035	4.5±0.3 5.7±0.5 5.7±0.5 7.6±0.5	3.2±0.3 5.0±0.5 6.3±0.5 9.0±0.5	X:1.30±0.30	0.35~1.00 0.35~1.2 0.35~1.2 0.5~1.5	2.0 3.0 3.0 3.5
			F:1.60±0.40		
			Z:2.00±0.40		
			E:2.50±0.40		
			A:3.00±0.50		

## Temperature Characteristic

Code	N	B	Y	E
Dielectric type	COG	X7R/X5R	Y5V	Z5U
Temp.range	-55~125℃	-55~125℃/-55~85℃	-30~85℃	+10~85℃
Cap.chang	0±60-250ppm	±15%	+22~-82%	+22~-56%

## Capacitance (Example)

\*Two significant figures followed by number of zero. 102=1000pF

Code(EIA code)	Cap.(pF)	Code(EIA code)	Cap.(pF)
0R5	0.5	101	100
2R0	2.0	102	1000(1nF)
100	10	105	1,000,000(1uF)



15 153	S S	S S	P P P	S S S	S S S S														
18 183	S S	S S	P P P	S S S	S S S S														
22 223	S S	S S	P P P	S S S	S S S S														
27 273	S	S S	P P P	S S S	S S S S														
33 333	S S	S S	P P P	S S S	S S S S														
39 393		S S	P P P	S S S	S S S S														
47 473	S S	S S S	P P P	S S S	S S S S														
56 563		S	P P P	S S S	S S M M														
68 683		S	P P P	S S S	S S M M														
82 823		S	P P P	S S S	S S M M														
( $\mu$ F)0.1 104	S S	S S	P P P	S S S	S/H S/H M M									F				F	
0.15 154		S	P P P	S S S	S S H H									F				F	
0.22 224	S	S S S	P P P	S S S	S S H H									F				F	X
0.33 334		S S	P P P P	M M M M	M M H H									F				F	X
0.47 474		S S	P P P P	H H H H	H H X X									F				Z	F
0.68 684			P P	H H X X	H H X X									F				Z	F
1.0 105		S S	P P P	H/X H/X X X	H H X X									F F				F Z	F
2.2 225		S	P P	H X X X	X X X X X									F F				F E	F F
3.3 335			P	H X	X X/L L L									F F				F E	F E
4.7 475			P	X X X X	X/L X/L X/L L L									F F F				F Z E	F E
10 106			P P	X X X	X/L X/L X/L L									F F Z				F Z Z	F Z E
22 226			P	X X	X/L L L									F Z	E			F Z Z	F F F E E

47	476									X				L	L			Z	Z	E	Z			Z	E	E	Z			Z	Z	Z	E
100	107									X				L	L			E	E	E					E	E			E	E	E		

### Z5U Capacitance range

SIZE		Z5U					
		0805	1206	1210	1808	1812	
Cap (nF)	Vr EIA	100V	100V	100V	100V	100V	250V
		10	103				
15	153						
22	223						
33	333						
47	473	H	H				
68	683	H	H				
100	104	H	H				F
150	154		H				F
220	224		H	X	F		F
330	334			X	F		Z
470	474			X	F	F	Z
680	684			X	F	F	Z
1000	105				F	Z	
1500	155					Z	
2200	225						

### X1Y2, X2Y3 Capacitance range

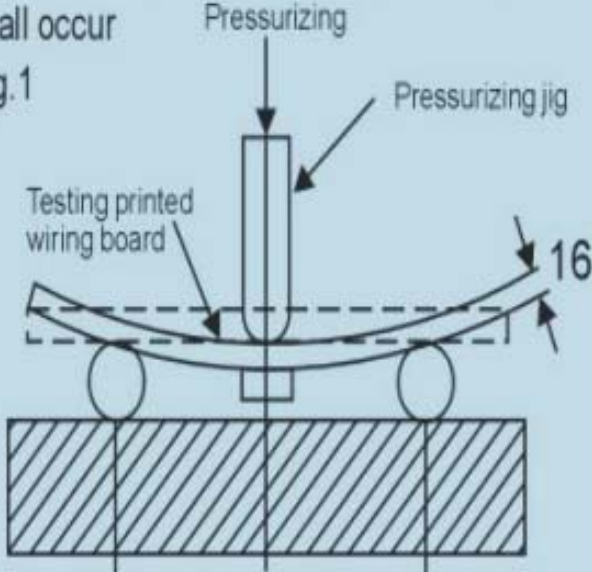
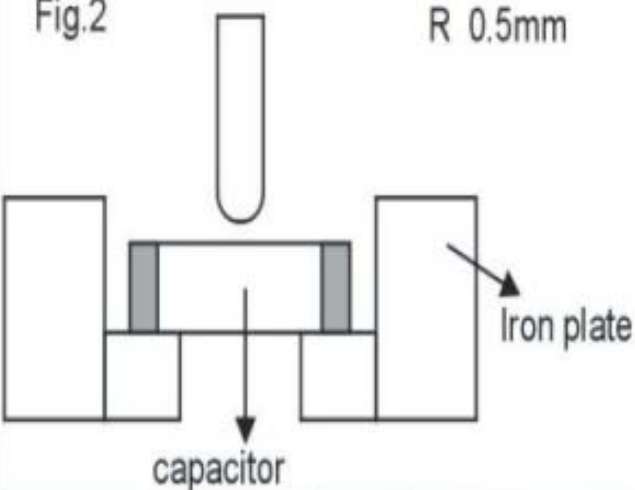
SIZE		NPO			
		1808	1812	2211	2220
Cap (pF)	Vr EIA	X2 Y3	X2 Y3	X1 Y2	X1 Y2
		5.0	5R0	F	F
7	7	F	F	F	F
10	100	F	F	F	F
12	120	F	F	F	F
15	150	F	F	F	F
18	180	F	F	F	F
22	220	F	F	F	F
27	270	F	F	F	F
33	330	F	F	F	F
39	390	F	F	F	F
47	470	F	F	F	F
56	560	F	F	F	F
68	680	F	F	F	F
82	820	F	F	F	F
100	101	F	F	F	F
120	121	Z	Z		
150	151	Z	Z		
180	181	Z	Z		
220	221	Z	Z		
270	271		Z		
330	331		Z		

SIZE		X7R			
		1808	1812	2211	2220
Cap (pF)	Vr EIA	X2 Y3	X2 Y3	X1 Y2	X1 Y2
		100	101	F	F
120	121	F	F	F	F
150	151	F	F	F	F
180	181	F	F	F	F
220	221	F	F	F	F
270	271	F	F	F	F
330	331	F	F	F	F
390	391	F	F	F	F
470	471	F	F	Z	F
560	561	F	F	Z	F
680	681	F	F	Z	F
820	821	F	F	Z	F
1000	102	F	F	Z	Z
1200	122	Z	F		Z
1500	152	Z	F		Z
1800	182	Z	F		Z
2200	222	Z	Z		Z
2700	272		Z		
3300	332		Z		
3900	392		Z		
4700	472		Z		

390	391	Z	
470	471	Z	

470	471	Z	
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No	Item	Test Method	Specification														
15	Capacitance Temperature Characteristic	<p>(a) NPO The temperature coefficient is determine during the capacitance measured in step 3 as a reference. When cycling the temperature sequentially from step 1 through 5. The capacitance shall be within the specified tolerance for the temperature coefficient.</p> <table border="1"> <thead> <tr> <th>Step</th> <th>Temperature(°C)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>+25±2°C</td> </tr> <tr> <td>2</td> <td>-55±3°C</td> </tr> <tr> <td>3</td> <td>+25±2°C</td> </tr> <tr> <td>4</td> <td>+125±3°C(for NPO/X7R) +85±3°C(for X5R/Y5V/Z5U)</td> </tr> <tr> <td>5</td> <td>+25±2°C</td> </tr> </tbody> </table> <p>(b) X7R,X5R, Y5V,Z5U The ranges of capacitance change compared with the 25±2°C value over the temperature range shall be</p>	Step	Temperature(°C)	1	+25±2°C	2	-55±3°C	3	+25±2°C	4	+125±3°C(for NPO/X7R) +85±3°C(for X5R/Y5V/Z5U)	5	+25±2°C	Dielectric	Temperature Range	Capacitance Change
			Step	Temperature(°C)													
			1	+25±2°C													
			2	-55±3°C													
			3	+25±2°C													
			4	+125±3°C(for NPO/X7R) +85±3°C(for X5R/Y5V/Z5U)													
			5	+25±2°C													
NPO	-55°C to +125°C	0±60 ppm/°C															
X7R	-55°C to +125°C	Within 15%															
X5R	-55°C to +85°C	Within 15%															
Z5U	+10°C to +85°C	Within +22%~-56%															
Y5V	-30°C to	Within															

No	Item	Test Method	Specification
		25 ± 2 °C value over the temperature range shall be within the specified ranges.	10V +85°C +22%~-82%
16	Resistance to Board Bending	<p>Mount the capacitor to the testing print wiring board. Then apply force in the direction shown in Fig.1. The bending stroke shall be more than 1mm.</p> <p>Pressuring is carried out at the rate of 1mm/s. After reaching the specified bending. Keeping it for 5 ± 1 seconds then measure the capacitance value.</p> <p>The capacitance could not be lower 5% of the initial value</p>	<p>No cracking or marking defects shall occur Unit:mm</p> <p>Fig.1</p> 
17	Chip Break Strength	<p>Place the capacitor on an iron plate, then gradually apply a load on the center of the chip until it breaks.</p> <p>Tip of push-pull gauge is shown in Fig.2</p>	<p>To load 2 kg at least. Φ 1.0mm R 0.5mm</p> <p>Fig.2</p> 
		Mount the capacitor on test board, then cycling the temperature	

18	Temperature Cycle	sequentially from step 1 to step 5, and perform 25 cycles.					No crack and electric failure	
		Step	NPO	X7R	X5R	Z5U		Y5V
			Temperature(°C) / time(min)		Temperature(°C) / time(min)			
		1	+25±2°C / 3±1		+25±2°C / 3±1			
		2	-55±2°C / 30±3		-30±2°C / 30±3 (Z5U IS +10±2°C/X5R IS -55±2°C)			
		3	+25±2°C / 3±1		+25±2°C / 3±1			
		4	+125±3°C / 30±3		+85±3°C / 30±3			
5	+25±2°C / 3±1		+25±2°C / 3±1					
Remove and let sit for 24±2hours(NPO) or 48±4hours(X7R,X5R,Z5U,Y5V) at room temperature(25°C), then measure.								

## Packing

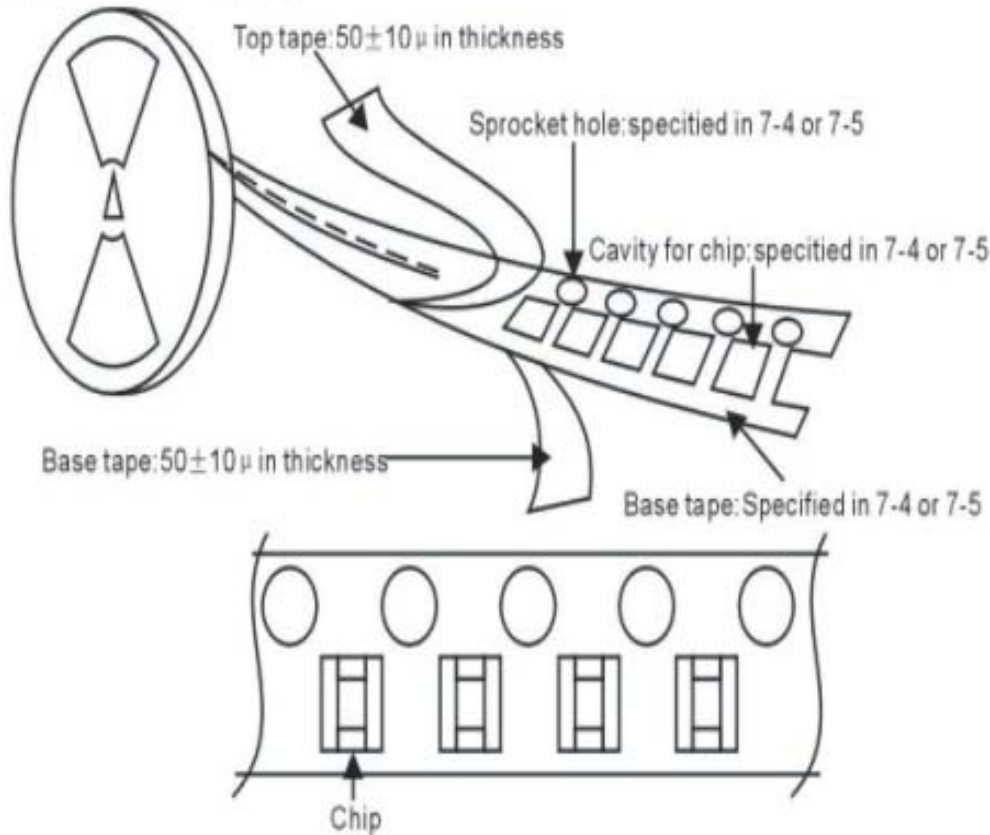
- Bulk Packaging : Packing code (B)
- Tape Packaging : Please specify the packing code when ordering.

Packing Code	Pcs /Reel	Reel size
5	500	7"
1	1000	7"
2	2000	7"
3	3000	7"

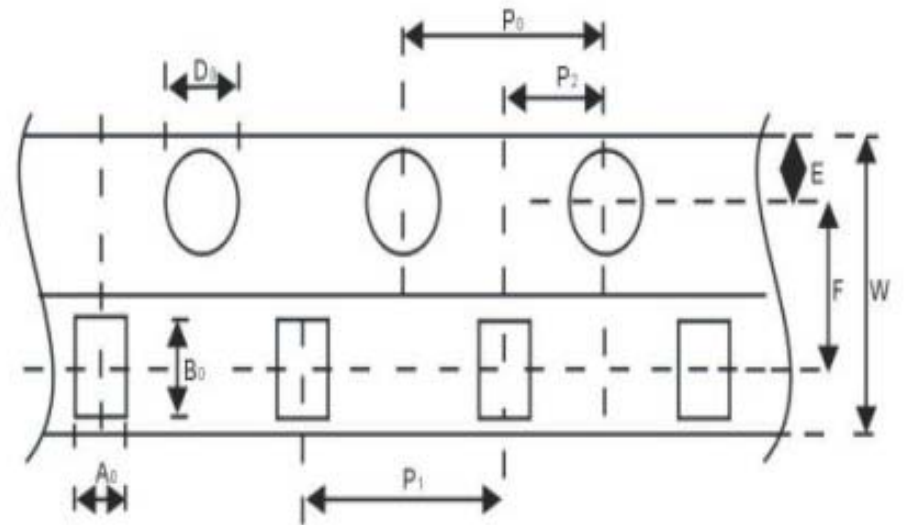


T	4000	7"	
U	10000	0402	7"
		0603	10"
S	15000	13"	
V	16000	13"	
W	20000	13"	

■ Appearance of Taping



■ Dimension of paper Tape



1 Init:mm

Mark	Chip size										tolerance
	0201	0402	0603	0805	1206	1210	1808	1812	2211 2220 2225	3035	
A <sub>0</sub> (width of compartment)	0.4	0.63	1	1.5	1.85	2.9	2.4	3.6	5.5 6.7	9.3	±0.1
B <sub>0</sub> (length of compartment)	0.63	1.13	1.8	2.25	3.45	3.6	4.9	4.9	6.0	7.9	±0.1
W (tape width)	8	8	8	8	8	8	12	12	12 16	16	±0.3
E (distance between a sprocket hole and upper)	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	±0.1
F (distance between centers of a sprocket and chip hole)	3.2	3.5	3.5	3.5	3.5	3.5	5.5	5.5	5.5 7	7	±0.1
D <sub>0</sub> (diameter of sprocket hole)	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	±0.1
P <sub>1</sub> (compartment pitch)	2 1	2	4	4	4	4	8	8	8 12	12	±0.1
P <sub>02</sub> (distance between centers of compartment hole and chip hole)	1 0.5	1	2	2	2	2	4	4	4 6	6	±0.1
P <sub>01</sub> (Sprocket hole pitch)	2 1	2	4	4	4	4	8	8	8 12	12	±0.1

- Paper thickness T :0.65±0.05 mm(for 0402 product)
- Paper thickness T :0.75±0.05mm(for thickness code S)
- Paper thickness T :0.95±0.05mm(for thickness code :P、M、H)
- Note : (1). The top tape and bottom tape shall not protrude beyond the edges of the tape, and shall not cover sprocket holes
- Note : (2). Cumulative tolerance of sprocket holes 10 pitch : ±0.3mm